Mental Health and the Gut Flora, the Research Evidence

When I was in my medical residence in psychotherapy in the 1970's in Ohio, I found I could successfully treat severe mental disorders with natural means. I found a French study that said that psychotics had a higher rectal temperature when they have an episode. I found that this was due to an imbalance in their bowel flora. The therapy I used is on page 15 of the book, and the rest of this book is dedicated to showing the new research validating my work. Desire Dubouet
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- PPIs, H₂ blockers
- Antibiotics
- Prokinetics
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- NSAIDs

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<td>10³ - 10⁵</td>
<td>Streptococcus Lactobacillus</td>
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<td>10⁴ - 10⁷</td>
<td>Streptococcus Lactobacillus Enterobacteriaceae</td>
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<td>Bacteroides Eubacterium Clostridium Ruminococcus Bifidobacterium</td>
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Eat more yogurt! Low levels of healthy gut bacteria could be the cause of mental health issues such as 'anxiety and schizophrenia'

- The average adult carries up to five pounds of bacteria
- Healthy bacteria are known as probiotics, commonly found in yogurt, soy yogurt or as dietary supplements
- Probiotics are also delivered in fecal transplants, in which stool from a healthy donor is delivered like a suppository to an infected patient
- Strep bacterium is linked to OCD
- Gut bacteria regulate dopamine levels
- A build-up of dopamine causes agitation and stress on the body
- Gut bacteria 'talk to the brain' through the immune system or parts of the nervous system

By DAILY MAIL REPORTER
People suffering from anxiety, might just need to eat more 'healthy' bacteria.

Some scientists think there may be a link between our digestive tract microbes and disorders such as anxiety, schizophrenia and autism.

They are beginning to recognise the power of healthy gut bacteria, especially seeing that the average adult carries up to five pounds of bacteria - trillions of microbes - in their digestive tract.

Probiotics are commonly consumed as part of fermented foods with specially added active live cultures, such as in yogurt, soy yogurt or as dietary supplements.

Probiotics are also delivered in fecal transplants, in which stool from a healthy donor is delivered like a suppository to an infected patient.

A study published in Nutritional Neuroscience from The Great Plains Laboratory, has shown that HPHPA levels - the chemical byproduct of the clostridia bacteria - are much higher in the urine of autistic children.

Those treated with antibiotics effective against clostridia show a decrease in symptoms of autism.

Dr James Greenblatt, a Boston-area psychiatrist, treated a teenager with severe obsessive–compulsive disorder (OCD), as well as attention deficit hyperactivity disorder (ADHD) and an array of digestive problems.

Greenblatt first did a simple urine test for the metabolite HPHPA and found that it was elevated.

He put the patient, Mary, on a course of high-powered probiotics to boost her good bacteria, followed by antibiotics, and her levels began to ‘dramatically’ go down, he told ABC News.

After six months, Mary's symptoms began to disappear. And by a year, they were gone.
Today, three years later, Mary is a senior in high school and has no sign of either mental disorder.

Autism: HPHPA levels - the chemical byproduct of the clostridia bacteria - are much higher in the urine of autistic children.

Dr James Greenblatt, a Boston-area psychiatrist, says all doctors should make organic acid urine testing for HPHPA levels a standard practice.
In some patients, the strep bacterium has been linked to OCD in a condition known as PANDAS - an acronym for Pediatric Autoimmune Neuropsychiatric Disorders Associated with Streptococcal infections.

PANDAS, which is a rare disease that usually appears in children, is hypothesised to be an autoimmune disorder that results in a variable combination of tics, obsessions, compulsions, and other symptoms that may be severe enough to qualify for diagnoses such as chronic tic disorder, OCD and Tourette syndrome.

A 10-year-old from Virginia was treated with probiotics after being incorrectly diagnosed with PANDAS after he developed compulsive symptoms following a strep infection and a lengthy course on antibiotics.

‘He had no gut flora,’ said his mother, Robin, who did not want to use her last name.

‘He had been healthy and athletically coordinated and then developed these compulsive behavior and tics. It didn't seem like it was in his control.’

After probiotics, ‘it was like night and day’, she told ABC News. ‘His symptoms went away and he was totally fine.’

A recent study in the journal Science shows that thin and fat people have different bacteria -- a discovery that could lead to weight-loss programmes.

Babies are born with a sterile digestive tract and first acquire their bacteria while traveling through the birth canal and get more in breast milk and in the world outside the womb through contact with other people.

Scientists are so far unable to identify every strain of bacteria, but they can test for the chemical byproducts that they produce, according to Greenblatt.
Stabilize Gut Flora to treat all Mental Disease and Avoid Sugar

He said he checks every patient for HPHPA with a simple organic acid urine test before moving ahead with medications to treat symptoms.

'Eight out of 10 people are fine,' he said. 'But in the two patients where it's elevated, it can have profound effects on the nervous system.'

More...

- **Could 'milk and cookie disease' be making your child ill? Doctor fears bedtime treats could cause string of health problems**
- **Science superheroes and famous thinkers form 'doomsday' society to save humanity from asteroids, pandemics - and itself**

'I don't know why this test isn't done on every psychiatric patient,' he said. 'I question that every day.'

HPHPA causes deactivation of an enzyme so that dopamine cannot be converted to the neurotransmitter neuroepinephrine, Greenblatt said, and that causes a build-up of dopamine.

'We know elevated levels in the dopamine gene cause agitation,' he told ABC News.

In one 2010 study at McMaster University in Canada, published in the journal Communicative and Integrative Biology, scientists found a link between intestinal microbiota and anxiety-like behaviour.

Researchers compared the behaviours of normal 8-week-old mice and those whose guts were stripped of microbes.

Those without bacteria showed higher levels of risk-taking and the stress hormone cortisol.

They also had altered levels of the brain chemical BDNF, which has been linked to anxiety and depression in humans.

Lab mice: A test showed that those without bacteria showed higher levels of the stress hormone cortisol and altered levels of the brain chemical BDNF, which has been linked to anxiety and depression in humans.
Jane Foster, associate professor of neuroscience and behavioral science and part of the McMaster University & Brain-Body Institute, says gut bacteria ‘talk to the brain in multiple ways through either the immune system or the enteric nervous system’.

However, while using probiotics may help a ‘subset of patients’, she said. It's not a ‘magic bullet’.

Early life stresses, nutrition and building a strong immune system all play an important role in a person's mental health, she said.
Stabilize Gut Flora to treat all Mental Disease and Avoid Sugar

IMPROVE YOUR MEMORY WITH SPINACH

High in brain-friendly folate & B-vitamins

Folate reduces inflammation that harms brain function

L-tyrosine in spinach improves mental focus

Just 1 cup of steamed spinach contains more than 65% of your Daily Value (DV) for folate and more than 20% of your DV for vitamin B6.
Stabilize Gut Flora to treat all Mental Disease and Avoid Sugar
Stabilize Gut Flora to treat all Mental Disease and Avoid Sugar

Probiotic yogurt stimulates the immune system
Peer-reviewed studies report that the regular use of yogurt reduces:
- the levels of harmful bacteria that promote dental decay and periodontal disease in the mouths of children;
- the risk of premature birth in women with bacterial vaginosis and preeclampsia (high blood pressure) in first time mothers;
- the likelihood of diarrhea and other gastrointestinal complaints relating to antibiotic use;
- the incidence of type 2 diabetes and metabolic syndrome according to intervention trials and large population studies.

Here is what Probiotics do for you and your family.

Stop Anti-biotics
Use Probiotics
Stabilize Gut Flora to treat all Mental Disease and Avoid Sugar

Anti-Biotics
unnaturally upset
the Immune system
and make you
dependent on the
Antibiotic. Good
for the drug co.
Bad for you

Anti-Biotics
Destroy the good
Bacteria we need for
Immunity. Anti-Biotics
weaken the immune
system

Improved
Digestion
Immunity
Disease Resistance

No Real Nutrition Here
WANTED: GOOD BACTERIA

Want to look and feel your very best? Start enjoying more foods naturally high in probiotics — and in the fiber-rich prebiotics that help those good bugs thrive.

PROBIOTIC-RICH FOODS

DAIRY SOURCES
- Yogurt
- Kefir
- Buttermilk
- Crème fraîche
- Lassi, a drink made from yogurt and water
- Aged cheeses, such as bleu, Gouda and cheddar

FRUIT AND VEGETABLE SOURCES
- Brined pickles
- Tangy chutneys
- Brined olives
- Sauerkraut and its ethnic variations — kimchi (Korean), tsukemono (Japanese), choucroute (French)
- Sauerruben (fermented sour turnips)
- Pickled beets

SOYBEAN SOURCES
- Miso
- Tempeh
- Natto
- Soy sauce
- Tamari

GRAIN SOURCES
- Traditional sourdough breads

NONDairy BEVERAGES
- Kombucha

PREBIOTIC-RICH FOODS

VEGGIES
- Tomatoes
- Artichokes
- Onions
- Chicory
- Greens (especially dandelion greens)
- Asparagus
- Garlic
- Leeks

FRUIT
- Berries
- Bananas

WHOLE GRAINS
- Oatmeal
- Barley
- Flaxseeds
- Wheat

LEGUMES
- Lentils
- Kidney beans
- Chickpeas
- Navy beans
- White beans
- Black beans
Stabilize Gut Flora to treat all Mental Disease and Avoid Sugar

Brain (CNS)
Perception and processing of sensory stimuli (somatic/autonomic)
Execution of voluntary motor responses (somatic)
Regulation of homeostatic mechanisms (autonomic)

Spinal cord (CNS)
Initiation of reflexes from ventral horn (somatic) and lateral horn (autonomic) gray matter
Pathways for sensory and motor functions between periphery and brain (somatic/autonomic)

Nerves (PNS)
Fibers of sensory and motor neurons (somatic/autonomic)

Ganglia (PNS)
Reception of sensory stimuli by dorsal root and cranial ganglia (somatic/autonomic)
Relay of visceral motor responses by autonomic ganglia (autonomic)

Digestive tract (ENS)
The enteric nervous system (ENS), located in the digestive tract, is responsible for autonomous functions and can operate independently of the brain and spinal cord.

The Brain in Your Gut
The gut's brain, known as the enteric nervous system, is located in sheaths of tissue lining the esophagus, stomach, small intestine and colon.

SMALL INTESTINE CROSS SECTION

Submucosal plexus
Layer contains sensory cells that communicate with the myenteric plexus and motor fibers that stimulate the secretion of fluids into the lumen.

Myenteric plexus
Layer contains the neurons responsible for regulating the enzyme output of adjacent organs.

Lumen
No nerves actually enter this area, where digestion occurs. The brains in the head and gut have to monitor conditions in the lumen across the lining of the bowel.

Source: Dr. Michael D. Gershon, Columbia University
Could 'milk and cookie disease' be making your child ill? Doctor fears bedtime treats could cause string of health problems

- Combination of dairy and sugar late at night is believed to be the cause of many childhood ailments such as coughs, sore throats and fatigue
- Pediatric otolaryngologist Dr Julie Wei calls it the 'milk and cookie disease'
- Her patients have seen symptoms improve after changing their diet

By SUZANNAH HILLS
PUBLISHED: 10:55 GMT, 12 September 2013 | UPDATED: 15:38 GMT, 12 September 2013

Many children enjoy a glass of milk with a cookie before bed but a doctor has found this popular snack may be responsible for a string of health problems.

Dubbed the 'milk and cookie disease', the combination of sugar and dairy late at night is believed to be the cause of many childhood ailments, including running noses, coughs, sore throats, constipation and fatigue.

Dr Julie Wei, a pediatric otolaryngologist at Nemours Children's Hospital in Orlando, Florida, made the connection after treating numerous children with the chronic symptoms.

Not such a treat: Childhood ailments such as coughs, sore throats and fatigue may be caused by the consumption of dairy and sugar before bed. The condition has been labelled 'milk and cookie disease'

She initially tried treating her young patients with medications, but it generally had little effect.
After looking further into the individual cases, she found that many of the children frequently ate sugary snacks such as cookies and lots of dairy products including milk before bed.

Dr Wei believed the combination was likely to be causing the food to back up into the stomach, esophagus and throat causing cold-like symptoms.

She asked her patients to stop eating dairy and sugary products before bedtime and found that their symptoms quickly improved significantly.

Dr Wei has called the condition 'milk and cookie disease' and suggests that up to 75 per cent of American children who are otherwise healthy may be suffering from it.

Research: Dr Julie Wei, a pediatric otolaryngologist at Nemours Children’s Hospital in Orlando, Florida, made the connection between bedtime snacks and childhood ailments after talking to her patients

She puts this down to the average American snacking more as they have less time to sit down for proper meals. She said: 'We’re busy people; no one’s really thinking about what their kids are eating.' The mother of one patient, five-year-old Jonathan Giambrone, said she has seen a significant improvement in her son's health since she stopped him from snacking late at night and only gave him water before bed on Dr Wei's recommendations.

Becky Giambrone told Fox News: 'It was really hard for him to take in a breath; he sounded like Darth Vader. In a three week period, we noticed a substantial difference.' Dr Wei recommends that children shouldn't have any snacks or any drinks but water up to two hours before bedtime to avoid food sitting in the stomach.
Stabilize Gut Flora to treat all Mental Disease and Avoid Sugar

Treatment of Mental Disease by Nutritional treatment of the Gut Flora

Author: Professor of Medicine Desire’ Dubounet, D. Sc. L.P.C.C.

It got me in trouble with the drug companies and the other psychiatrists in Ohio when I found a way to treat mental diseases like depression and schizophrenia with nutritional and gut bacteria therapies. I developed this in the 1970’s. Now the research has further validated my work but here is my base plan. I was so successful there was great pressure on me from the system.

1st stop all bad sugars, and all bad oils. See
http://www.downloads.imune.net/medicalbooks/Quantum%20Digestion%20-%20FOSSIL%20LAP.pdf

2nd Avoid all anti-biotics as best you can. If you can do not take the mental synthetic drugs, if you are taking them then wait till the program and then if you can work with your doctor to reduce and wean off of them. The reason you are mentally sick is not because you are deficient in a drug.


3rd cleanse and detox the intestine with activated charcoal pills 3 at meals, some gentle cascara laxative, and lots of fruit and vegetable fiber to pull out the toxins.

http://www.downloads.imune.net/medicalbooks/Quantum%20Digestion%20-%20FOSSIL%20LAP.pdf
http://www.downloads.imune.net/medicalbooks/The%20Wisdom%20of%20Dr%20Henry%20Bielers%20on%20foods%20and%20detox.pdf

4th eat for medicine and get SCIO/Educator/ Eductor tested to see what foods and vitamins you need for medicines.

http://www.downloads.imune.net/medicalbooks/Depression%20is%20a%20Meaningful%20Part%20of%20Life.pdf

5th enemas, colonics can be used to make sure you are cleansing the gut. But make sure you get lots and lots of good bacteria from probiotics, best used before bed on an empty stomach or between meals. Good mega B vitamins from natural sources are used with meals.

6th I tell the patient to not use coffee except for 1.5 hours after a meal. And avoid coffee when possible. And use some sodium bicarb (like Alka seltzer) 1.5 hour after a meal. This will increase the small intestine digestion of the vitamins.
7th now your counseling will work better with the systemic issues solved. Explore sex identity issues, fears of diversity, conformity pressures, and mental issues. Counseling without boy stability is mostly useless


http://www.downloads.imune.net/medicalbooks/There%20is%20No%20Law%20of%20Attraction%20but%20a%20Law%20of%20Interpretation.pdf


http://www.downloads.imune.net/medicalbooks/Path%20to%20Enlightenment.pdf

Dr Gary Huffnagle with Sarah Wernick

The Probiotics Revolution

Breakthrough discoveries to:
- Prevent allergies and asthma
- Fight IBS
- Enhance immune function
- Curb inflammation

Stabilize Gut Flora to treat all Mental Disease and Avoid Sugar
Transferring the gut microbes from a mouse with colon tumors to germ-free mice makes those mice prone to getting tumors as well, according to the results of a study published in *mBio*, the online open-access journal of the American Society for Microbiology. The work has implications for human health because it indicates the risk of colorectal cancer may well have a microbial component.

"We know that humans have a number of different community structures in the gut. When you think about it, maybe different people - independent of their genetics - might be predisposed," says Joseph Zackular of the University of Michigan, an author on the study.

Scientists have known for years that inflammation plays a role in the development of colorectal cancer, but this new information indicates that interactions between inflammation and subsequent changes in the gut microbiota create the conditions that result in colon tumors.

Co-author Patrick Schloss, also of the University of Michigan, was somewhat surprised by the clarity of the results.

"We saw more than two times the number of tumors in mice that received the cancerous community [than in mice that received a healthy gut community]," says Schloss. "That convinced us that it is the community that is driving tumorigenesis. It's not just the microbiome, it's not just the inflammation, it's both."

Known risk factors for developing colorectal cancer include consuming a diet rich in red meat, alcohol consumption, and chronic inflammation in the gastrointestinal tract (patients with inflammatory bowel diseases, such as ulcerative colitis, are at a greater risk of developing colorectal cancer, for instance). Cancer patients also exhibit shifts in the composition of their gut microbiota - a phenomenon called dysbiosis - but it's unclear whether changes in the microbiome drive the development of cancer or the cancer drives changes in the microbiome.

It's a question of the chicken and the egg, says Zackular. "Is this the microbiome of someone with cancer or is the microbiome driving tumorigenesis?"

Schloss, Zackular, and their colleagues reasoned that the composition, structure, and functional capacity of the gut microbiome all directly affect tumor development in the colon, so they set out to address this chicken-and-egg conundrum with mice. Using a tumor-inducing regimen, they induced the formation of colorectal tumors in a set of mice, then collected feces and bedding from those tumor-bearing mice and gave them over to germ-free mice. (Mice are coprophagic, so inoculating germ-free mice with a new gut microbiome is as easy as that.) They then administered the regimen to these new mice.

The results were stark: mice given the microbiota of the tumor-bearing mice had more than two times as many colon tumors as the mice given a healthy microbiota. What's more, normal mice that were given antibiotics before and after inoculation had significantly fewer tumors than the mice that got no antibiotics, and tumors that were present in these antibiotic-treated mice were significantly smaller than tumors in untreated mice. This suggests that specific populations of microorganisms were essential for the formation of tumors, so the researchers then drilled down into which groups of bacteria were present in the test animals and controls.

Looking at the microorganisms, they found that tumor-bearing mice harbored greater numbers of bacteria within the *Bacteroides*, *Odoribacter*, and *Akkermansia* genera, and decreased numbers of bacteria affiliated with members of the Prevotellaceae and
Porphyromonadaceae families. Three weeks after they were inoculated with the communities from the tumor-bearing mice, the germ-free mice had a gut microbiome that was very similar to the tumor-bearing mice, and they had a greater abundance of the same bacterial groups associated with tumor-formation.

"In all these [mouse] models the inflammation is critical, but so is the change in the communities," says Schloss. "We liken it to a feed-forward type mechanism where the inflammation is changing the community and the community is inducing inflammation. They make each other worse to the point that you have higher rates of tumor formation."

To follow up on the work, Schloss and Zackular are now studying the functions of the groups that are and are not associated with tumor formation.

"If you can better understand what functions in the microbial community are important for protecting against tumor formation or making it worse, we can hopefully translate those results to humans to understand why people do or do not get colorectal cancer, to help develop therapeutics or dietary manipulations to reduce people's risk," says Schloss.

Provided by American Society for Microbiology
NEW YORK — The oodles of microbes living in the gut may affect brain function, recent studies suggest.

The human body is home to about 100 trillion bacteria — that means there are about 10 times as many bacterial cells as human cells in your body. Increasing evidence shows these microbes — collectively known as the microbiome — play a role in health, including mental health. Studies in mice suggest that microbes living in the digestive tract are linked to depression and anxiety.

"There’s a strong relationship between gastroenterology and psychiatric conditions," said gastroenterologist Dr. Stephen Collins of McMaster University in Canada, at a symposium here at the New York Academy of Sciences.

Many people with inflammatory bowel syndrome (IBS) have depression or anxiety, Collins said. His research team has found several lines of evidence that intestinal microbes influence the brain.
Anxious mice

Collins and his colleagues carried out an experiment in which they kept mice in a dark box with access to well-lit outside areas. Some of the mice were "germ-free," because they were raised in sanitized conditions. The mice were allowed to explore at will. The researchers measured the amount of time all the mice spent outside the box: The more time they spent out exploring, the less anxious they were considered to be.

Compared with normal mice, the germ-free mice spent more time exploring outside the box, and standing on high ledges, a sign of risk-taking, Collins said.

The researchers then gave antibiotics to the mice with normal gut bacteria. The rodents became less cautious or anxious, venturing outside the box more than usual. At the same time, their levels of brain-derived neurotrophic factor (BDNF), a molecule linked to lower depression and anxiety, increased. When the mice stopped receiving antibiotics, their less-adventurous behavior and brain chemicals returned to normal levels.

In another experiment, Collins and his colleagues colonized germ-free mice known to have passive behavior with bacteria taken from mice that exhibit daring behavior. The treated germ-free mice became more active and less cautious, they found. Likewise, when they colonized mice that were normally active with bacteria from passive mice, the animals became more passive.

The findings suggest that intestinal bacteria may somehow affect behavior, making mice more or less anxious. But does that mean gut microbes could affect the human psyche too?

Human bugs and brains

Researchers at UCLA led by gastroenterologist Dr. Emeran Mayer did an experiment to find out. They gave healthy women fermented milk, with either a probiotic supplement, or no probiotic, and scanned their brains while showing them photos of people with emotional facial expressions. The women who were given the probiotic showed a reduced brain response to the faces, compared with the women not given the probiotic, the study found.

Others have speculated that late-onset autism and other brain disorders may also be linked with abnormal gut fauna.
Children with autism have a lot of intestinal problems, said Rosa Krajmalnik-Brown, who studies how microbial communities may benefit human health at Arizona State University, in Phoenix. Krajmalnik-Brown led a study that found that children with autism had fewer types of gut bacteria and lower numbers of a few key microbes, compared with typical children.

It remains unclear exactly how gut bacteria may influence mental health. Researchers have noted that the vagus nerve, controls the rhythmic motions of the digestive tract and sends sensory information back to the brain, could be involved.

More research is needed, however, to solve the puzzle of how stomach bugs influence behavior.

Introduction

Credit: Dreamstime

Although you might like to think of yourself as your own person, you actually share your body with many millions of bacteria.

In fact, it's estimated that the human gut contains 100 trillion bacteria, or 10 times as many bacteria as cells in the human body.

These bacteria, or gut flora, influence health in many ways, from helping to extract energy from food to building the body's immune system, to protecting against infection with harmful, disease-causing bacteria.

Researchers are only just beginning to understand how differences in the composition of gut bacteria may influence human health. From what we know so far, here are five ways gut flora affect wellness:
Obesity

Credit: Dreamstime

A growing body of research suggests that gut bacteria influence weight. One recent study found that obese people have a less diversity in their gut flora than lean people. Other studies have suggested that an increase in a group of gut bacteria called Firmicutes, and a decrease in a group of gut bacteria called Bacteroidetes, are linked with obesity.

Research done on animals may provide clues about how gut bacteria affect weight gain. One recent study found that mice that received a "gut bacteria transplant" from an obese person gained more weight and fat mass than those who received bacteria from a lean person.

What's more, the transplant altered the metabolism of the mice: animals that received gut bacteria from an obese person had metabolic changes linked with obesity in humans (such as increased production of compounds called branched-chain amino acids); while those that received gut bacteria from a lean person had metabolic changes linked with reduced body weight (such as increased breakdown of carbohydrates).

Heart disease

Credit: Heart rate via Shutterstock
When gut bacteria feed on certain foods — including eggs and beef — they produce a compound that could boost the risk of heart disease, according to a recent study.

Participants in the study with high levels of the compound, called trimethylamine-N-oxide (TMAO), in their blood were 2.5 times more likely to have a heart attack, stroke or to die over a three-year period compared with people with low levels of the compound.

Although the findings are preliminary, the results reinforce existing dietary recommendations for lowering heart disease risk, which advise people to reduce consumption of foods high in fat and cholesterol (such as beef and eggs), the researchers said.

Immune system

Credit: by Ross Toro, Infographics Artist

Your gut is the main area in the body where the immune system interacts with what's brought in from the outside world. Thus, the interaction between gut bacteria and your own cells appear to play an important role in the development of a fully-functioning immune system. According to a 2003 review paper in the Lancet, lymphatic tissue in the intestine contains the largest pool of cells capable of producing an immune response.

A 2012 study found that whether babies are fed breast milk or formula influences the composition of their gut bacteria, and in turn, the development of their immune system. Babies fed only breast milk had more diversity in their gut bacteria than babies who were fed only formula. There was also a link between the genes that were "turned on" in the babies' gut bacteria, and the genes that were "turned on" in their immune system.
Disrupting gut bacteria may have an effect on the brain, and in turn, behavior, studies in animal suggest.

A 2011 study in mice found that animals given antibiotics (which kill gut bacteria) became less anxious, and when their gut bacteria was restored, so was their anxiety.

Mice given antibiotics also showed changes in their brain chemistry that have been linked to depression.

The researchers said they suspect the bacteria are producing chemicals that can access and influence the brain.

If gut bacteria play a role in human behavior, its possible that therapies that aim to restore normal gut flora, such as probiotics, may be helpful in correcting behavior and mood changes in people with gastrointestinal diseases, according to the researchers. However, it's not clear if the results apply to people.
Abnormal gut bacteria in infants may be one cause of colic, or excessive crying, recent research suggests.

In the study, colicky babies (who cry for more than three hours a day without a medical reason) had a distinct bacterial "signature": They had higher numbers of bacteria from a group called Proteobacteria in their guts compared to babies without colic.

Proteobacteria include bacteria known to produce gas, which may cause pain in infants and lead to crying, the researchers said.

These abnormalities disappeared after the first few months of life, which suggests they are temporary. However, this study was small and conducted for just a few months, so additional, longer studies are needed to confirm the results.

Gut Bacteria Might Guide The Workings Of Our Minds

by ROB STEIN

November 18, 2013 3:07 AM

Could the microbes that inhabit our guts help explain that old idea of "gut feelings?" There's growing evidence that gut bacteria really might influence our minds.

"I'm always by profession a skeptic," says Dr. Emeran Mayer, a professor of medicine and psychiatry at the University of California, Los Angeles. "But I do believe that our gut microbes affect what goes on in our brains."

Mayer thinks the bacteria in our digestive systems may help mold brain structure as we're growing up, and possibly influence our moods, behavior and feelings when we're adults. "It opens up a completely new way of looking at brain function and health and disease," he says.

So Mayer is working on just that, doing MRI scans to look at the brains of thousands of volunteers and then comparing brain structure to the types of bacteria in their guts. He thinks he already has the first clues of a connection, from an analysis of about 60 volunteers.
Mayer found that the connections between brain regions differed depending on which species of bacteria dominated a person's gut. That suggests that the specific mix of microbes in our guts might help determine what kinds of brains we have — how our brain circuits develop and how they're wired.

Credit: Benjamin Arthur for NPR

Of course, this doesn't mean that the microbes are causing changes in brain structure, or in behavior.

But other researchers have been trying to figure out a possible connection by looking at gut microbes in mice. There they've found changes in both brain chemistry and behavior. One experiment involved replacing the gut bacteria of anxious mice with bacteria from fearless mice.

"The mice became less anxious, more gregarious," says Stephen Collins of McMaster University in Hamilton, Ontario, who led a team that conducted the research.

It worked the other way around, too — bold mice became timid when they got the microbes of anxious ones. And aggressive mice calmed down when the scientists altered their microbes by changing their diet, feeding them probiotics or dosing them with antibiotics.

While no one's sure which foods are good for our microbiomes, but eating more veggies can't hurt.

The Salt

Can We Eat Our Way To A Healthier Microbiome? It's Complicated

To find out what might be causing the behavior changes, Collins and his colleagues then measured brain chemistry in mice. They found changes in a part of the brain involved in emotion and mood, including increases in a chemical called brain-derived neurotrophic factor, which plays a role in learning and memory.

Scientists also have been working on a really obvious question — how the gut microbes could talk to the brain.
A big nerve known as the vagus nerve, which runs all the way from the brain to the abdomen, was a prime suspect. And when researchers in Ireland cut the vagus nerve in mice, they no longer saw the brain respond to changes in the gut.

"The vagus nerve is the highway of communication between what's going on in the gut and what's going on in the brain," says John Cryan of the University College Cork in Ireland, who has collaborated with Collins.

Gut microbes may also communicate with the brain in other ways, scientists say, by modulating the immune system or by producing their own versions of neurotransmitters.

"I'm actually seeing new neurochemicals that have not been described before being produced by certain bacteria," says Mark Lyte of the Texas Tech University Health Sciences Center in Abilene, who studies how microbes affect the endocrine system. "These bacteria are, in effect, mind-altering microorganisms."

This research raises the possibility that scientists could someday create drugs that mimic the signals being sent from the gut to the brain, or just give people the good bacteria — probiotics — to prevent or treat problems involving the brain.

Knight (left) and Bucheli take soil samples from beneath one of the decomposing bodies.

Shots - Health News

Could Detectives Use Microbes To Solve Murders?

One group of scientists has tested mice that have behaviors similar to some of the symptoms of autism in humans. The idea is that the probiotics might correct problems the animals have with their gastrointestinal systems — problems that many autistic children also have.

In the mice, many of their autism behaviors were no longer present or strongly ameliorated with probiotics, says Paul Patterson at the California Institute of Technology in Pasadena, Calif. His research will be published soon in the journal Cell.
Experiments to test whether changing gut microbes in humans could affect the brain are only just beginning.

One team of researchers in Baltimore is testing a probiotic to see if it can help prevent relapses of mania among patients suffering from bipolar disorder.

"The idea is that these probiotic treatments may alter what we call the microbiome and then may contribute to an improvement of psychiatric symptoms," says Faith Dickerson, director of psychology at the Sheppard Pratt Health System.

"It makes perfect sense to me," says Leah, a study participant who has been diagnosed with bipolar disorder. She agreed to talk with NPR if we agreed not to use her full name. "Your brain is just another organ. It's definitely affected by what goes on in the rest of your body."

It's far too soon to know whether the probiotic has any effect, but Leah suspects it might. "I'm doing really well," she says. "I'm about to graduate college, and I'm doing everything right."

Mayer also has been studying the effects of probiotics on the brain in humans. Along with his colleague Kirsten Tillisch, Mayer gave healthy women yogurt containing a probiotic and then scanned their brains. He found subtle signs that the brain circuits involved in anxiety were less reactive, according to a paper published in the journal Gastroenterology.

But Mayer and others stress that a lot more work will be needed to know whether that probiotic — or any others — really could help people feel less anxious or help solve other problems involving the brain. He says, "We're really in the early stages."
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FRIENDLY BACTERIA
Intestinal microbiota, probiotics and mental health: from Metchnikoff to modern advances: Part II – contemporary contextual research

Alison C Bsted\(^1\), Alan C Logan\(^2\) and Eva M Selhub\(^3\)

Abstract
In recent years there has been a renewed interest concerning the ways in which the gastrointestinal tract – its functional integrity and microbial residents – might influence human mood (e.g. depression) and behavioral disorders. Once a hotbed of scientific interest in the early 20th century, this area lay dormant for decades, in part due to its association with the controversial term ‘autointoxication’. Here we review contemporary findings related to intestinal permeability, small intestinal bacterial overgrowth, lipopolysaccharide endotoxin (LPS) exposure, D-lactic acid, propionic acid, and discuss their relevance to microbiota and mental health. In addition, we include the context of modern dietary habits as they relate to depression, anxiety and their potential interaction with intestinal microbiota.

Keywords: intestinal microbiota, Autointoxication, Depression, Anxiety, Probiotics, Microbial ecology, Lipopolysaccharide endotoxin, Diet, Intestinal permeability, Microbial ecosystems

Introduction
As outlined in Part I of this review, early 20th century scientists and clinicians placed emphasis on the importance of the gastrointestinal tract – its functional integrity and its microbes – as an influencing factor in depression and other mental health disorders. The interest in this topic, housed under the controversial term of autointoxication, disappeared rapidly by 1930. The reverse-order, top-down, focus would subsequently dominate research for decades; i.e. depression and anxiety as an influencing factor in the gastrointestinal disorders. We introduce Part II by reflecting upon one of the last articles of the autointoxication genre (1933), wherein neuropathologist Armando Ferraro and clinical psychiatrist Joseph E. Kilman of the New York Psychiatric Institute wrote the following in Psychiatric Quarterly journal [1]:

‘It is far from our mind to conceive that all mental conditions have the same etiological factors, but we feel justified in recognizing the existence of cases of mental disorders which have as a basic etiological factor a toxic condition arising in the gastrointestinal tract’

In 1933, with the understanding that ‘we must not forget here the possibility that in the future more appropriate and more delicate biochemical methods may allow us to detect [circulating gut-derived toxins] in an easier and more accurate way than we are now able to do, Ferraro and Kilman proposed a multi-discipline collaborative effort. They wanted to establish a framework and begin with careful experimental lines of investigation. Their recommendation was to bring together experts to examine the following variables, while at the same time taking into consideration observable changes in animal behavior.

1. Alterations in intestinal permeability to toxins
2. The effect of synergy among potentially toxic chemicals arising from the gastrointestinal tract (e.g. certain bacteria produce indole and p-cresol individually; in preliminary experiments, Ferraro and Kilman reported that gut-derived toxins produced CNS toxicity at much lower doses vs. solo administration).
Intestinal microbiota, probiotics and mental health: from Metchnikoff to modern advances: part III – convergence toward clinical trials

Alison C. Bosted1, Alan C. Logan2 and Eva M. Selhub3

Abstract

Rapid scientific and technological advances have allowed for a more detailed understanding of the relevance of intestinal microbiota, and the entire body-wide microbiome, to human health and well-being. Rodent studies have provided suggestive evidence that probiotics (e.g. lactobacillus and bifidobacteria) can influence behavior. More importantly, emerging clinical studies indicate that the administration of beneficial microbes, via supplementation and/or fecal microbial transplant (FMT), can influence end-points related to mood state (glycemic control, oxidative status, urinary toxins), brain function (functional magnetic resonance imaging (MRI), and mental outlook (depression, anxiety). However, despite the advances in the area of gastro-biological psychiatry, it becomes clear that there remains an urgent need to explore the value of beneficial microbes in controlled clinical investigations. With the history explored in this series, it is fair to ask if we are now on the cusp of major clinical breakthroughs, or are we merely in the quicksand of Autoimmunization II?

Keywords: Intestinal microbiota, Autointoxication, Depression, Anxiety, Probiotics, Microbial ecology, Lipopolysaccharide endotoxicity, Diet, Intestinal permeability, MNP, Microbial ecosystems

Introduction

Though the first two parts of this series, we have attempted to provide a historical and contextual approach to the more direct lines of contemporary evidence as it relates to gut microbiota, its intentional manipulation, and mental health. Here in part III we will discuss more specific research related to the direct experimental and clinical effects of probiotics in the context of stress, neuro-physiology, behavior and mental outlook. The emerging studies clearly show that we are in the midst of a very exciting time within gastro-biological psychiatry. Still, as we conclude our series, it becomes evident that there many unanswered questions and an urgent need for expanded clinical investigations.

Experimental dysbiosis, stress and probiotics

More clinically relevant information related to behavior is provided by animal studies involving interactions between stress, dietary habits and alterations to the normal homeostasis of gut microbiota (i.e. dysbiosis rather than germ-free). The term dysbiosis is often erroneously attributed to Metchnikoff, however, both eubiosis (healthy life in steady state) and dysbiosis (shift from healthy state of being) were already in popular use decades before Metchnikoff gained fame. Physician Elliot E. Farley used the terms together in his 1890 book related to plant, animal and human resiliency [1]. In the context of intestinal microbiology, dysbiosis is a term that gained medical acceptance in the 1960s [2]. In animal models, researchers can induce dysbiosis through experimental infection, psychological stress, Western dietary habits, and/or the administration of antimicrobial agents [3]. To date, the emerging research shows that all of these factors may interact together in a vicious cycle – i.e. in experimental studies, induced states of dysbiosis can promote behavior indicative of anxiety and cognitive dysfunction in animals [4,5]. On the other hand, psychological stress itself leads to dysbiosis [4,5], and it also encourages the consumption of a fast-food-style diet [6], which only serves to further promote dysbiosis [7].
INTESTINAL HEALTH

Healthy Function
Healthful bacteria that coats and protects the intestinal wall, along with other factors obtained from food or from natural intestinal secretions, inhibit unhealthful bacteria and contribute to maintaining bacterial balance and optimal intestinal health.

Lactoperoxidase:
A protein enzyme that damages unhealthful bacteria.

Globulin Proteins:
Proteins that prevent unhealthful bacteria from adhering to the intestine.

Lactoferrin:
A protein that traps iron and blocks its use by unhealthy bacteria, thus starving them.

Unhealthy Function
With healthful bacteria and other protective factors missing, unhealthful bacteria, yeast, parasites and toxins may accumulate, damaging the intestinal wall, producing poor intestinal health.

Yeast
Intestinal Deterioration
Toxins
Parasites

Toxins being detoxified

Unhealthful Bacteria
Lactobacillus acidophilus
Bifidobacteria
Fruco-oligosaccharides
The Neuroscience of the Gut
Strange but true: the brain is shaped by bacteria in the digestive tract

By Robert Martone

Researchers track the gut-brain connection

Image: dyoma

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People may advise you to listen to your gut instincts: now research suggests that your gut may have more impact on your thoughts than you ever realized. Scientists from the Karolinska Institute in Sweden and the Genome Institute of Singapore led by Sven Pettersson recently reported in the Proceedings of the National Academy of Sciences that normal gut flora, the bacteria that inhabit our intestines, have a significant impact on brain development and subsequent adult behavior.

We human beings may think of ourselves as a highly evolved species of conscious individuals, but we are all far less human than most of us appreciate. Scientists have long recognized that the bacterial cells inhabiting our skin and gut outnumber human cells by ten-to-one. Indeed, Princeton University scientist Bonnie Bassler compared the approximately 30,000 human genes found in the average human to the more than 3 million bacterial genes inhabiting us, concluding that we are at most one percent human. We are only beginning to understand the sort of impact our bacterial passengers have on our daily lives.

Moreover, these bacteria have been implicated in the development of neurological and behavioral disorders. For example, gut bacteria may have an influence on the body’s use of vitamin B6, which in turn has profound effects on the health of nerve and muscle...
cells. They modulate immune tolerance and, because of this, they may have an influence on autoimmune diseases, such as multiple sclerosis. They have been shown to influence anxiety-related behavior, although there is controversy regarding whether gut bacteria exacerbate or ameliorate stress-related anxiety responses. In autism and other pervasive developmental disorders, there are reports that the specific bacterial species present in the gut are altered and that gastrointestinal problems exacerbate behavioral symptoms. A newly developed biochemical test for autism is based, in part, upon the end products of bacterial metabolism.

But this new study is the first to extensively evaluate the influence of gut bacteria on the biochemistry and development of the brain. The scientists raised mice lacking normal gut microflora, then compared their behavior, brain chemistry and brain development to mice having normal gut bacteria. The microbe-free animals were more active and, in specific behavioral tests, were less anxious than microbe-colonized mice. In one test of anxiety, animals were given the choice of staying in the relative safety of a dark box, or of venturing into a lighted box. Bacteria-free animals spent significantly more time in the light box than their bacterially colonized littermates. Similarly, in another test of anxiety, animals were given the choice of venturing out on an elevated and unprotected bar to explore their environment, or remain in the relative safety of a similar bar protected by enclosing walls. Once again, the microbe-free animals proved themselves bolder than their colonized kin.

Pettersson’s team next asked whether the influence of gut microbes on the brain was reversible and, since the gut is colonized by microbes soon after birth, whether there was evidence that gut microbes influenced the development of the brain. They found that colonizing an adult germ-free animal with normal gut bacteria had no effect on their behavior. However, if germ free animals were colonized early in life, these effects could be reversed. This suggests that there is a critical period in the development of the brain when the bacteria are influential.

*Escherichia, Bacillus, and Saccharomyces produce norepinephrine.*

*Candida, Streptococcus, Escherichia, and Enterococcus produce serotonin,*

*while Bacillus and Serratia have the potential to produce dopamine.*
The Wide-Ranging Influence of Gut Microbes on Your Mental and Physical Health

September 05, 2012 | 380,876 views

By Dr. Mercola

There are 100 trillion cells in your body, but 90% of the genetic material is not yours. It is from the bacteria, fungi, viruses and other microorganisms, i.e. your microflora. Gut microbes are big in the news lately, as researchers continue to discover the important roles these tiny organisms play in your overall health and well-being. We now know that your microflora influence your:

- Genetic expression
- Immune system
- Weight, and
- Risk of numerous chronic and acute diseases, from diabetes to cancer

Most recently, research has shown that a certain set of these microbes may actually influence the activity of genes in your brain — and the parts they play are not small parts. They may work to manipulate your behavior, and your memory as well.

Microbes Manipulate Your Mind

According to a recent article in The Guardian, certain species of gut bacteria have been found to influence gene activity in your brain. Some of this research was published in 2011. Mice lacking gut bacteria were found to engage in "high-risk behavior," and this altered behavior was accompanied by neurochemical changes in the mouse brain.

According to the authors, microbiota (your gut flora) may play a role in the communication between your gut and your brain, and:

“Acquisition of intestinal microbiota in the immediate postnatal period has a defining impact on the development and function of the gastrointestinal, immune, neuroendocrine and metabolic systems. For example, the presence of gut microbiota regulates the set point for hypothalamic-pituitary-adrenal (HPA) axis activity.”

But they also discovered other differences between the mice with normal gut flora and those lacking gut bacteria. When examining the animals' brains, they discovered a number of genetic alterations in the germ-free mice. According to The Guardian:
"Brain-derived neurotrophic factor (BDNF) was significantly up-regulated, and the 5HT1A serotonin receptor sub-type down-regulated, in the dentate gyrus of the hippocampus. The gene encoding the NR2B subunit of the NMDA receptor was also down-regulated in the amygdala.

All three genes have previously been implicated in emotion and anxiety-like behaviors.

BDNF is a growth factor that is essential for proper brain development, and a recent study showed that deleting the BDNF receptor TrkB alters the way in which newborn neurons integrate into hippocampal circuitry and increases anxiety-like behaviors in mice. Serotonin receptors, which are distributed widely throughout the brain, are well known to be involved in mood, and compounds that activate the 5HT1A subtype also produce anxiety-like behaviors.

The finding that the NR2B subunit of the NMDA receptor down-regulated in the amygdala is particularly interesting. NMDA receptors are composed of multiple subunits, but those made up of only NR2B subunits are known to be critical for the development and function of the amygdala, which has a well established role in fear and other emotions, and in learning and memory. Drugs that block these receptors have been shown to block the formation of fearful memories and to reduce the anxiety associated with alcohol withdrawal in rodents."

Your Gut Bacteria Are Under Constant Assault

Your lifestyle can and does influence your gut flora on a daily basis. For example, your gut bacteria are extremely sensitive to:

- Antibiotics
- Chlorinated water
- Antibacterial soap
- Agricultural chemicals
- Pollution

All of these common exposures can wreak havoc on the makeup of bacteria in your gut, but researchers are now increasingly looking at the cascading ill effects of antibiotics in particular.

Not only are antibiotics overused in medicine, the vast majority of these drugs enter you via livestock – you consume antibiotics every time you eat meat from an animal raised in a confined animal feeding operation (CAFO). In fact, about 80 percent of all the antibiotics produced are used in agriculture – not only to fight infection, but
to promote unhealthy (though profitable) weight gain in the animals. It is crucial that you avoid conventionally-raised meats.

**Early Use of Antibiotics Also Linked to Obesity**

With that in mind, is it any wonder that researchers are now finding that antibiotics are associated with weight gain in humans as well?

"For many years now, farmers have known that antibiotics are great at producing heavier cows for market," Dr. Jan Blustein, MD, PhD, professor of population health and medicine told PreventDisease.com in a recent article. "While we need more research to confirm our findings, this carefully conducted study suggests that antibiotics influence weight gain in humans, and especially children..."

According to The Washington Post:

"The use of antibiotics in young children might lead to a higher risk of obesity, and two new studies, one on mice and one on humans, conclude that changes of the intestinal bacteria caused by antibiotics could be responsible. Taken together, the New York University researchers conclude that it might be necessary to broaden our concept of the causes of obesity and urge more caution in using antibiotics."

The first study, published in the journal Nature, found that young mice treated with low doses of common antibiotics gained 10-15 percent more fat than the untreated controls. After surveying the gut bacteria in the mice, they found that mice treated with antibiotics had a different composition of gut bacteria compared to the untreated mice. Specifically, certain species of bacteria previously shown to be associated with obesity were found in higher concentrations in the treated mice. Furthermore, after genetic analysis of the bacteria’s metabolism, they discovered that genes responsible for fat synthesis had greater levels of activity in the treated mice.

According to lead author Martin Blaser:

"The rise of obesity around the world is coincident with widespread antibiotic use, and our studies provide an experimental linkage. It is possible that early exposure to antibiotics primes children for obesity later in life."

The co-author Dr Ilseung Cho added:

"By using antibiotics, we found we can actually manipulate the population of bacteria and alter how they metabolize certain nutrients. Ultimately, we were able to affect body composition and development in young mice by changing their gut microbiome through this exposure."

The second study, published in the International Journal of Obesity, aimed to corroborate these findings in human subjects. The study, which included more than
10,000 children, found that treating babies with antibiotics before the age of six months old appears to predispose them to being overweight in childhood. Children exposed to antibiotics between the ages of six to 14 months did not have significantly higher body mass than unexposed children.

While this study does not prove causation between antibiotic use in infancy and later obesity, it does show a correlation, and the mechanism appears to be related to the way antibiotics alter your child's gut flora. However, excess weight is not the only, or the worst problem that such imbalance can create. As previously explained by Dr. Natasha Campbell-McBride, children with imbalanced gut flora are more prone to develop neurological disorders, such as ADD/ADHD and various learning disorders. These children are also more prone to vaccine damage.

**Prebiotics Research Highlighted at American Chemical Society Meeting**

Increasingly, researchers are finding that proper nutrition is not just about getting the right kind and amount of nutrients needed for biological processes. You also need to nourish these non-human cells in your body, i.e. your gut microflora. This issue was recently raised at the 244th National Meeting & Exposition of the American Chemical Society. According to a recent article in NewHope360:

"'Just as people need food to thrive, so do the billions of healthful bacteria that live in our guts, our gastrointestinal tract,' [Robert] Rastall [Phd] explained. 'There's a large and expanding body of scientific evidence that bacteria in the gut play a role in health and disease. Prebiotics are foods that contain nutrients that support the growth and activity of these friendly bacteria.'

Rastall contrasted prebiotics to the more familiar probiotics, already being promoted on the labels of food like yogurt and some dietary supplements.

*Probiotic foods actually contain friendly bacteria like Lactobacillus acidophilus believed to release healthful substances as they grow in the GI tract. Prebiotics are indigestible food ingredients that provide no nutrition to people. Their purpose is to nourish the friendly bacteria among the estimated 100 trillion microbes living inside the human GI tract."

While raised awareness about the importance of prebiotics and probiotics is good news, it comes with the territory that researchers are also working on ways to produce prebiotics that can easily be added to processed foods. Pre- and probiotics are very sensitive to heat, and excessive heat-treatment is a hallmark of most processed foods. It therefore stands to reason that any prebiotic inventions they come up with for the processed foods market will inevitably be of inferior quality, and I strongly recommend avoiding any and all processed foods that proclaim to contain prebiotics or probiotics, and stick with the real thing, i.e. traditionally fermented foods for healthful probiotics, and unprocessed whole foods for prebiotics, such as onions and garlic.
Study Finds "Clear Link" Between Inflammation, Bacterial Communities and Cancer

Demonstrating just how far-reaching the health impact of the bacterial balance in your gut can be, another recent study claims the key factor behind cancer appears to be ecological rather than genetic. Published in the journal *Science*, the study suggests cancer may be due to a chain reaction that starts with inflammation that disrupts your gut ecosystems, allowing pathogens, such as E.coli, to invade your gut and cause cellular damage. The presence of E.coli was increased by a factor of 100 by inflammation, and 80 percent of germ-free mice infected with E.coli developed colorectal cancer, while germ-free mice inoculated with another common gut bacterium remained cancer-free, although these mice, like the others, did develop severe colitis (gut inflammation).

According to a press release by the University of North Carolina:

"In a series of experiments conducted with mice prone to intestinal inflammation, the researchers found that inflammation itself causes significant simplification in diverse communities of gut microbes and allows new bacterial populations to establish major footholds. Among the bacterial taxa invading the disturbed intestinal ecosystem, the research team found a greatly increased presence of E. coli and related bacteria.

By putting E. coli bacteria into mice that were raised under sterile conditions, the team also found that the presence of E. coli promoted tumor formation. When regions of the E. coli genome known to be involved in DNA damage were removed, the ability of the E. coli to cause tumors was substantially decreased.

The researchers noted that the mouse results may have implications for human health as well, as they also found an E. coli variant with the suspect genes in high percentages of human patients with colorectal cancer and irritable bowel disease.

...’As is usual in human studies, we didn't have cause and effect,’ Fodor noted. ’We don't know if microbes are somehow causing conditions to shift in the gut that would cause cancer or if there are conditions that are associated with cancer that would increase the openness of the gut to particular microbes. A shift in the microbial community is associated with inflammation... It is interesting that the microbial community is actually changing with the disease state, which indicates that it is either responding to or contributing to the disease state.’"

Like Bacteria, Cancer Cells Rely on Communication and Cooperation

In related news, an article published in *Trends in Microbiology* examines the shared traits of cancer cells and bacteria. Bacteria and cancer cells both use sophisticated...
communication to gain supremacy within the host. As reported by Medical News Today:

"Inspired by the social and survival tactics of bacteria, the team presents a new picture of cancer as a meta-community of smart communicating cells possessing special traits for cooperative behavior. Using intricate communication, cancer cells can distribute tasks, share resources, differentiate, and make decisions. Before sending cells to colonize organs and tissues throughout the body (metastasis), 'spying cells' explore the body and return the cancer's origin. Only then do metastatic cells leave the primary tumor and navigate to new posts.

Also like bacteria, cancer cells change their own environment. They induce genetic changes and enslave surrounding normal cells, forcing them to do the disease's bidding - providing physical support, protecting them from the immune system, and more."

Three years ago, I posted a TED video featuring Bonnie Bassler, in which she discusses how bacteria "talk" to each other using a chemical language that lets them coordinate defense and mount attacks. Cancer cells, as it turns out, employ similar forms of communication, and as discussed by Bassler, these discoveries pave the way for the development of drugs aimed at shutting down or altering cell-to-cell communication.

This is a Flash-based video and may not be viewable on mobile devices.

According to Medical News Today:

"The team also suggests further research into cancer 'cannibalism,' when cancer cells may consume their peers when they run out of resources. The idea is to send signals which trigger cancer cells to kill each other, which can be done with bacteria. Other researchers have demonstrated that injected bacteria can 'outsmart cancer.' Bacteria can be used to induce gap junctions between the cancer cells and immune cells, 'teaching' the immune system to recognize and kill the tumor cells."

The Phenomenal Health Benefits of Fermented Vegetables

Cultured or fermented foods have a very long history in virtually all native diets, and have always been highly prized for their health benefits. The advent of processed foods dramatically altered the human diet, and we're now reaping the results in the form of rapidly rising chronic health problems. I believe the shunning of traditionally fermented foods has a lot to do with this.

The culturing process produces beneficial microbes that are extremely important for your health as they help balance your intestinal flora. If you do not regularly consume the traditionally fermented foods below, a high-quality probiotic supplement will provide similar benefits:
- Fermented vegetables
- Lassi (an Indian yoghurt drink, traditionally enjoyed before dinner)
- Fermented milk, such as kefir (a quart of unpasteurized kefir has far more active bacteria than you can possibly purchase in any probiotics supplement)
- Natto (fermented soy)

When choosing fermented foods, steer clear of pasteurized versions, as pasteurization will destroy many of the naturally occurring probiotics. This includes most of the "probiotic" yogurts you find in every grocery store these days; since they're pasteurized, they will be associated with all of the problems of pasteurized milk products and they typically contain added sugars, high fructose corn syrup, artificial coloring, or artificial sweeteners, all of which will only worsen your health. You clearly want to avoid any milk that is laced with rBGH.

Fermented foods are also some of the best chelators and detox agents available, meaning they can help rid your body of a wide variety of toxins, including heavy metals.

When you first start out, you'll want to start small, adding as little as half a tablespoon of fermented vegetables to each meal, and gradually working your way up to about a quarter to half a cup (2 oz to 4 oz) of fermented vegetables or other cultured food with one to three meals per day. Since cultured foods are efficient detoxifiers, you may experience detox symptoms, or a "healing crisis," if you introduce too many at once.

**Learn to Make Your Own Fermented Vegetables**

Fermented vegetables are easy to make on your own. It's also the most cost-effective way to get high amounts of healthful probiotics in your diet. To learn how, review the following interview with Caroline Barringer, a Nutritional Therapy Practitioner (NTP) and an expert in the preparation of the foods prescribed in Dr. Natasha Campbell-McBride's Gut and Psychology Syndrome (GAPS) Nutritional Program. In addition to the wealth of information shared in this interview, I highly recommend getting the book *Gut and Psychology Syndrome*, which provides all the necessary details for Dr. McBride's GAPS protocol.

Although you can use the native bacteria on cabbage and other vegetables, it is typically easier to get consistent results by using a starter culture. Caroline prepares hundreds of quarts of fermented vegetables a week and has found that she gets great results by using three to four high quality probiotic capsules to jump start the fermentation process.
Caroline prepares the vegetables commercially and I used hers for a month before I started making my own. So, if you just want to put your toe in the water and see if you like them, you can order a jar or two and try them out. You can find her products on [www.CulturedVegetables.net](http://www.CulturedVegetables.net) or [www.CulturedNutrition.com](http://www.CulturedNutrition.com).

**AVOID This to Optimize Your Gut Flora!**

Along with eating naturally fermented foods and/or taking a high-quality supplement, it's essential that you avoid sugar, including fructose. Sugar nourishes pathogenic bacteria, yeast, and fungi in your gut, which may actually harm you more than its impact on insulin resistance. One of the major results of eating a healthy diet like the one described in my [nutrition plan](http://www.CulturedNutrition.com) is that you cause your beneficial gut bacteria to flourish, and they secondarily perform the real "magic" of restoring your health.

Remember, an estimated 80 percent of your immune system is located in your gut, which is just one more reason why "tending to" your gut microflora is an essential element of good health. A robust immune system, supported by your flourishing inner ecosystem, is your number one defense against ALL disease, from the common cold to cancer.

I feel very strongly that if we can catalyze a movement to get more people to implement this ancient dietary wisdom to their normal eating patterns, then we'll start seeing a radical change in health.

**Changing gut bacteria through diet affects brain function, UCLA study shows**

*By Rachel Champeau May 28, 2013*

![Dr. Kirsten Tillisch](http://example.com/dr_kirsten_tillisch)
UCLA researchers now have the first evidence that bacteria ingested in food can affect brain function in humans. In an early proof-of-concept study of healthy women, they found that women who regularly consumed beneficial bacteria known as probiotics through yogurt showed altered brain function, both while in a resting state and in response to an emotion-recognition task.

The study, conducted by scientists with the Gail and Gerald Oppenheimer Family Center for Neurobiology of Stress, part of the UCLA Division of Digestive Diseases, and the Ahmanson–Lovelace Brain Mapping Center at UCLA, appears in the current online edition of the peer-reviewed journal Gastroenterology.

The discovery that changing the bacterial environment, or microbiota, in the gut can affect the brain carries significant implications for future research that could point the way toward dietary or drug interventions to improve brain function, the researchers said.

"Many of us have a container of yogurt in our refrigerator that we may eat for enjoyment, for calcium or because we think it might help our health in other ways," said Dr. Kirsten Tillisch, an associate professor of medicine in the digestive diseases division at UCLA's David Geffen School of Medicine and lead author of the study. "Our findings indicate that some of the contents of yogurt may actually change the way our brain responds to the environment. When we consider the implications of this work, the old sayings 'you are what you eat' and 'gut feelings' take on new meaning."

Researchers have known that the brain sends signals to the gut, which is why stress and other emotions can contribute to gastrointestinal symptoms. This study shows what has been suspected but until now had been proved only in animal studies: that signals travel the opposite way as well.

"Time and time again, we hear from patients that they never felt depressed or anxious until they started experiencing problems with their gut," Tillisch said. "Our study shows that the gut–brain connection is a two-way street."

The small study involved 36 women between the ages of 18 and 55. Researchers divided the women into three groups: one group ate a specific yogurt containing a mix of several probiotics — bacteria thought to have a positive effect on the intestines — twice a day for four weeks; another group consumed a dairy product that looked and tasted like the yogurt but contained no probiotics; and a third group ate no product at all.

Functional magnetic resonance imaging (fMRI) scans conducted both before and after the four-week study period looked at the women's brains in a state of rest and in response to an emotion-recognition task in which they viewed a series of pictures of people with angry or frightened faces and matched them to other faces showing the same emotions. This task, designed to measure the engagement of
affective and cognitive brain regions in response to a visual stimulus, was chosen because previous research in animals had linked changes in gut flora to changes in affective behaviors.

The researchers found that, compared with the women who didn't consume the probiotic yogurt, those who did showed a decrease in activity in both the insula — which processes and integrates internal body sensations, like those from the gut — and the somatosensory cortex during the emotional reactivity task.

Further, in response to the task, these women had a decrease in the engagement of a widespread network in the brain that includes emotion-, cognition- and sensory-related areas. The women in the other two groups showed a stable or increased activity in this network.

During the resting brain scan, the women consuming probiotics showed greater connectivity between a key brainstem region known as the periaqueductal grey and cognition-associated areas of the prefrontal cortex. The women who ate no product at all, on the other hand, showed greater connectivity of the periaqueductal grey to emotion- and sensation-related regions, while the group consuming the non-probiotic dairy product showed results in between.

The researchers were surprised to find that the brain effects could be seen in many areas, including those involved in sensory processing and not merely those associated with emotion, Tillisch said.

The knowledge that signals are sent from the intestine to the brain and that they can be modulated by a dietary change is likely to lead to an expansion of research aimed at finding new strategies to prevent or treat digestive, mental and neurological disorders, said Dr. Emeran Mayer, a professor of medicine (digestive diseases), physiology and psychiatry at the David Geffen School of Medicine at UCLA and the study's senior author.

"There are studies showing that what we eat can alter the composition and products of the gut flora — in particular, that people with high-vegetable, fiber-based diets have a different composition of their microbiota, or gut environment, than people who eat the more typical Western diet that is high in fat and carbohydrates," Mayer said. "Now we know that this has an effect not only on the metabolism but also affects brain function."

The UCLA researchers are seeking to pinpoint particular chemicals produced by gut bacteria that may be triggering the signals to the brain. They also plan to study whether people with gastrointestinal symptoms such as bloating, abdominal pain and altered bowel movements have improvements in their digestive symptoms which correlate with changes in brain response.
Meanwhile, Mayer notes that other researchers are studying the potential benefits of certain probiotics in yogurts on mood symptoms such as anxiety. He said that other nutritional strategies may also be found to be beneficial.

By demonstrating the brain effects of probiotics, the study also raises the question of whether repeated courses of antibiotics can affect the brain, as some have speculated. Antibiotics are used extensively in neonatal intensive care units and in childhood respiratory tract infections, and such suppression of the normal microbiota may have long-term consequences on brain development.

Finally, as the complexity of the gut flora and its effect on the brain is better understood, researchers may find ways to manipulate the intestinal contents to treat chronic pain conditions or other brain related diseases, including, potentially, Parkinson's disease, Alzheimer's disease and autism.

Answers will be easier to come by in the near future as the declining cost of profiling a person's microbiota renders such tests more routine, Mayer said.

The study was funded by Danone Research. Mayer has served on the company's scientific advisory board. Three of the study authors (Denis Guyonnet, Sophie Legrain-Raspaud and Beatrice Trotin) are employed by Danone Research and were involved in the planning and execution of the study (providing the products) but had no role in the analysis or interpretation of the results.

**UCLA's Gail and Gerald Oppenheimer Family Center for Neurobiology of Stress**, part of the **UCLA Division of Digestive Diseases**, is an NIH-funded multidisciplinary, translational research program partially supported by philanthropy. Its mission is to identify the role of the brain in health and medical disease. The Center is comprised of several research programs which focus on the interactions of the brain with the digestive, cardiovascular and urological systems, chronic pain and mind brain body interactions.

**How much do intestines (gut) control our brain? Psycho Neuro Endo: 2012 Sept.**

27.11.2012

Both Hypothalamic-Pituitary Axis axis (HPA) and SMA (Sympatho Adrenal Medullary axis) play key role in regulating the effects of physical/psychological stress. Infective agents can activate this system through pro inflammatory cytokines. Recent studies have shown that HPA is tightly regulated to respond efficiently to gut pathogens such as Escherichia coli. (Zimomra et al,2011). Adrenal cortex can be directly activated by PGE2 from the immune system stimulated by gut pathogens.

**What about the non pathogenic microorganisms living inside us? Do they play with our brain and mind?**
The human gut is inhabited by 1000-10000 trillion micro-organisms, which is ten times the number of human cells in our bodies and contains 150 times as many genes as our genome consisting of more than 1000 species and 7000 strains mostly dominated by bacteria.

Colonisation of the infant gut commences at birth. Complex adult-like microbiome is evident by year one. Infection, disease, diet and antibiotics might alter this, though the tendency is to restore a stable diversity after these challenges. With age, the composition changes and some of it is linked to adverse health effects in the host.

There is now an expanding volume of evidence to support the view that these commensal organisms within the gut play a role in early programming and later responsivity of the stress system (Grenham et al., 2011). The brain-gut axis is bidirectional in nature. The vagus nerve provides an important line of communication between the gut microbes and the HPA. Experiments have shown that CRF mRNA in the hypothalamus increases 2 h after vagal stimulation and subsequently the plasma levels of ACTH are markedly elevated. The Enteric Nervous System (ENS), is a complex neuronal network with multiple neurotransmitters and neuromodulators including 5-HT, acetylcholine and CRF. CRFR1 and CRFR2 receptors here act as signalling peptides in the brain—gut axis. Stress results in the recruitment and activation of CRF receptors in the colon to induce the stress-related changes in gut function.

Germ free animal studies (Animals born via surgical methods as against vaginal delivery would have no gut microbiia if kept in sterile environment or by using broad spectrum antibiotics to clean up the gut ) showed that their gut structure become different from controls. (eg greatly enlarged cecum, reduced intestinal surface area, increased enterochromaffin cell area, smaller villous thickness etc ). What about brain? … Toll-like receptors (TLRs) present on cells of the innate immune system is key to recognition of pathogens and in initiating a cascade of reactions that end in activating HPA. In the absence of the resident enteric flora, these receptors show low or absent expression profiles in the gut and this compromise the appropriate immune and neuroendocrine responses to pathogenic threats.

These microbia may also be playing a role in development or early tuning of the HPA axis. The germ free mice produces an exaggerated release of corticosterone and ACTH to a mild restraint stress compared to controls. This exaggerated response can be reversed by introduction of microbial colonies. Studies suggest that microbial content of the gut is critical to the development of an appropriate stress response later in life. This should occur during a narrow window in early life. Hippocampal receptors, BDNF levels (which is crucial in neuro plasticity), serotonergic system etc are shown to be different in germ free animals. Some of these change also correlate with decreased anxiety in germ free animals.

We know that maternal separation, an early life stressor, can result in long-term HPA changes (O’Mahony et al., 2011), it is now shown that this can cause a significant decrease in faecal lactobacilli on day 3 post separation. Studies also show that such early stressors during critical periods can cause in microbial changes in measurable later in adult life. Can we modulate this axis?
Probiotics: These are live organisms and health benefit claims are exaggerated. Some recent work has suggested antianxiety property.(Bercik et al., 2011, Messaoudi et al., 2011) in rodents. Authors caution that many such effects in rodents do not show that in human beings. Another study found that chronic treatment with the Probiotic Lactobacillus rhamnosus over 28 days produced animals with lower levels of corticosterone. They showed reduced depressive behaviours and anxiety. This was accompanied by changes in brain GABA expressions (Bravo et al., 2011). Interestingly, these benefits and changes were not seen in vagotomised animals indicating that the Vagus is a key route of communication between Probiotic bacteria and the brain. Another study has shown that specific Lactobacillus strains could induce the expression of m-opioid and cannabinoid receptors in intestinal epithelial cells and mimic the effects of morphine in promoting analgesia (Rousseaux et al., 2007).

Martin et al. (2009) using NMR and mass spectroscopy based studies in 30 human subjects (2 weeks), showed that human subjects with higher anxiety were distinct in their gut microbial activity, energy homoeostais etc and a dietary intervention reversed these changes.

Just like these microbes influence our brain, brain can alter them also. Signalling molecules released into the gut lumen from cells in the lamina propria that are under the control of the CNS can result in changes in gastrointestinal motility and secretion as well as intestinal permeability, thus altering the environment in which the bacteria reside (Rhee et al., 2009). Psychological stress can increase permeability of the gut allowing bacteria and bacterial antigens to cross the epithelial barrier and this can activate a mucosal immune response which in turn alters pro-inflammatory cytokines and perhaps activate the HPA.

It would be of great significance to know the mechanism through which stress change the gut permeability. Clark (2005) showed that a rise in the pro-inflammatory cytokine interferon g play a key role here with the cascade of actions ending in disruption of tight junctions.

Depression and Gut Microbes: Significant differences in serum IgM and IgA against LPS of enterobacteria were found in patients with major depression than in normal volunteers (Maes et al 2008), indicating increased translocation of Gram- negative bacteria playing a role in this.

Conclusions:
Gut microbes can activate the HPA. They might also have a role in early programming and subsequent responsivity of the HPA. Probiotics could have a role in decreasing the behavioural and endocrine components of stress. Prospective studies in patients with mood disorders examining the gut microbiota, immune parameters and HPA activity can throw further light on this emerging area. Therapeutic agents targeting the gut microflora useful in treatments for stress-related psychiatric and gastrointestinal disorders could emerge from such research.
Mental health disorders might start in the gut, not in the brain

By Kathleen Blanchard G+

2011-05-18 07:21

Disruption of normal gut microbes changes brain chemistry.

Researchers from McMasters University say they now have evidence showing bacteria in the gut can alter behavior and brain chemistry, potentially making mental health disorders treatable with probiotics. The scientists found behavior and brain chemistry changes in mice when they manipulated bacteria in the gut with antibiotics.

When gut flora changed, the mice had an increase in brain derived neurotrophic factor (BDNF), which has been associated with depression and anxiety. Some of the mice in the experiment were bred to be germ free. Without normal gut flora, the scientists noted the mice were passive. When they colonized them with bacteria from mice bred to be more active, their behavior became more daring and exploratory.

Conversely, when the researchers altered gut bacteria in active mice, they became more passive.

Behavior changes when gut microbes altered

Stephen Collins, professor of medicine and associate dean research, Michael G. DeGroote School of Medicine said, “The exciting results provide stimulus for further investigating a microbial component to the causation of behavioral illnesses.”

The study is the first to link mental health disorders to intestinal bacteria and is published in the journal Gastroenterology.

The scientists note irritable bowel syndrome and other intestinal disorders are frequently accompanied by anxiety and depression, leading them to explore whether disruption of gut microbes might alter brain chemistry that could lead to mental health disorders.

Collins said when bacteria in the gut returned to normal in the mice, their behavior changed. The mice became less anxious and cautious and brain chemistry returned to normal.

He notes past studies have focused on the role intestinal bacteria play in early brain development. Premysl Bercik, assistant professor of medicine, who conducted research in the Farncombe Family Digestive Health Research Institute said the findings might indicate probiotics could have a role for treating anxiety, depression and other mental health disorders, especially those associated with gastrointestinal conditions like irritable bowel syndrome.

The authors say the finding show a variety of factors can influence behavior. Disruption of gut bacteria was shown to alter brain chemicals. They speculate any change in intestinal bacteria could also influence behavior and potentially lead to anxiety, depression and other mental health disorders.
Titre du document / Document title
Fecal microflora in healthy infants born by different methods of delivery: Permanent changes in intestinal flora after cesarean delivery

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Résumé / Abstract
Background: Newborn infants in modern maternity hospitals are subject to numerous factors that affect normal intestinal colonization—for example, cesarean delivery and antimicrobial agents. To study the duration of the effect of external factors on intestinal colonization, two groups of infants with different delivery methods were investigated. Methods: The fecal flora of 64 healthy infants was studied prospectively: Thirty-four infants were delivered vaginally and 30 by cesarean birth with antibiotic prophylaxis administered to their mothers before the delivery. The fecal flora was cultured on nonselective and selective media in infants 3 to 5, 10, 30, 60, and 180 days of age. Gastrointestinal signs were recorded daily by the mothers for 2 months. Results: The fecal colonization of infants born by cesarean delivery was delayed. Bifidobacterium-like bacteria and Lactobacillus-like bacteria colonization rates reached the rates of vaginally delivered infants at 1 month and 10 days, respectively. Infants born by cesarean delivery were significantly less often colonized with bacteria of the Bacteroides fragilis group than were vaginally delivered infants: At 6 months the rates were 36% and 76%, respectively (p = 0.009). The occurrence of gastrointestinal signs did not differ between the study groups. Conclusions: This study shows for the first time that the primary gut flora in infants born by cesarean delivery may be disturbed for up to 6 months after the birth. The clinical relevance of these changes is unknown, and even longer follow-up is needed to establish how long-lasting these alterations of the primary gut flora can be.

Psychobiotics: A Novel Class of Psychotropic
Here, we define a psychobiotic as a live organism that, when ingested in adequate amounts, produces a health benefit in patients suffering from psychiatric illness. As a class of probiotic, these bacteria are capable of producing and delivering neuroactive substances such as gamma-aminobutyric acid and serotonin, which act on the brain-gut axis. Preclinical evaluation in rodents suggests that certain psychobiotics possess antidepressant or anxiolytic activity. Effects may be mediated via the vagus nerve, spinal cord, or neuroendocrine systems. So far, psychobiotics have been most extensively studied in a liaison psychiatric setting in patients with irritable bowel syndrome, where positive benefits have been reported for a number of organisms including Bifidobacterium infantis. Evidence is emerging of benefits in alleviating symptoms of depression and in chronic fatigue syndrome. Such benefits may be related to the anti-inflammatory actions of certain psychobiotics and a capacity to reduce hypothalamic-pituitary-adrenal axis activity. Results from large scale placebo-controlled studies are awaited.
Antibiotics Could be to Blame for Skyrocketing Mental Illness Rates

by Anthony Gucciardi
October 19th, 2011
Updated 11/09/2012 at 1:34 pm

A new report published in the popular journal Nature has revealed that antibiotics are permanently destroying beneficial bacteria within the gut, a condition scientists link to mental illness. While it has been known for some time that antibiotics contribute to the development of drug-resistant superbugs and certain gut problems, the
link between antibiotic use and mental illness through the permanent destruction of beneficial bacteria only further tops the pharmaceutical paradigm. In fact, the pharmaceutical paradigm set in place by drug makers is so vast that it actually offers drug-based ‘solutions’ to the very problems that drugs originally created!

After kids are given excessive amounts of antibiotics that lead to the destruction of their gut health and the subsequent onset of mental illness, they are then given deadly antipsychotics and other psychiatric drugs to ‘treat’ the condition that originated from pharmaceutical drug use. It is a system that, whether purposeful or not, generates large profits for many prescription-happy doctors and drug manufacturers alike. Perhaps the most troubling part of this system is the massive fraud committed by financially-invested corporations to stop the truth about these drugs and other mainstream medical ‘treatments’ from getting to the general public.

The Pharmaceutical Paradigm

The general public has the right to know that dangerous antipsychotics are not going to ‘cure’ anything, and researchers have found that simply improving gut health and bacteria through probiotic supplementation or consumption will make a profound difference in your mental health and clarity:

“It may be that those changes in gut bacteria not only contribute to the generation of gut symptoms, like diarrhea or pain, but may also contribute to this altered behavior that we see in those patients,” said researcher Stephen Collins.

It seems that many large corporations act as gatekeepers, doctoring study results and attempting to discredit any research that endangers profits. Unfortunately, there will always be greedy individuals willing to go along with the scam. Such is the case with Dr. Scott Reuben, a well-respected anesthesiologist who was the former chief of acute pain of the Baystate Medical Center in Springfield Massachusetts. Dr. Reuben altered the results of 21 studies to deceive customers into thinking that Vioxx and Celebrex were safe. Of course this is not an isolated incident, simply one that received mainstream attention.

Rejuvenating Gut Health

While the damage to beneficial bacteria may be permanent, you can still utilize natural strategies to put that good bacteria back into the gut. Through the consumption of probiotics, you can restore beneficial bacteria that has been damaged through use of antibiotics. It is possible to do this through either supplementation or probiotic-rich foods, though you may find consuming such foods to be a challenge. Fermented food items such as sauerkraut, tempeh, miso or kefir are all rich sources of probiotic bacteria.

In addition to restoring beneficial bacteria into the gut through the use of probiotics, eliminating or severely reducing sugar intake will also be instrumental in restoring gut health and eliminating mental illness. Not only will you be improving your digestion and mental performance, you will be drastically slashing your risk of cancer, inflammation, and countless other diseases.

Read more: http://naturalsociety.com/antibiotics-could-be-to-blame-for-skyrocketing-mental-illness-rates/#ixzz2lP44lu3A

Antibiotics: Killing Off Beneficial Bacteria … for Good?

- BY MARYN MCKENNA
It’s an accepted concept by now that taking antibiotics in order to quell an infection disrupts the personal microbiome, the population of microorganisms that we all carry around in our guts, and which vastly outnumbers the cells that make up our bodies. That recognition supports our understanding of *Clostridium difficile* disease — killing the beneficial bacteria allows *C. diff* room to surge and produce an overload of toxins — as well as the intense interest in establishing a research program that could demonstrate experimentally whether the vast industry producing probiotic products is doing what it purports to do.

But implicit in that concept is the expectation that, after a while — after a course of antibiotics ends — the gut flora repopulate and their natural balance returns.

What if that expectation were wrong?

In a provocative editorial published this week in *Nature*, Martin Blaser of New York University’s Langone Medical Center argues that antibiotics’ impact on gut bacteria is permanent — and so serious in its long-term consequences that medicine should consider whether to restrict antibiotic prescribing to pregnant women and young children.

Early evidence from my lab and others hints that, sometimes, our friendly flora never fully recover. These long-term changes to the beneficial bacteria within people’s bodies may even increase our susceptibility to infections and disease. Overuse of antibiotics could be fuelling the dramatic increase in conditions such as obesity, type 1 diabetes, inflammatory bowel disease, allergies and asthma, which have more than doubled in many populations.
Among the findings he cites in support: The population-level observation that the incidence of infection with *H. pylori*, the bacterial cause of gastric ulcers, has declined over decades just as the incidence of esophageal cancer has risen. In addition, he offers his own research group’s observation that children who don’t acquire *H. pylori* are at greater risk of developing allergy and asthma, and their findings that eradicating *H. pylori* affects the production of the two hormones, ghrelin and leptin, that play a role in weight gain.

Are antibiotics to blame for the decline in *H. pylori*? Blaser points out that the organism is vulnerable to the same antibiotics that are prescribed to children for ear infections and colds — and that children routinely receive up to 20 courses of antibiotics before they reach adulthood. In addition, he says, one-third to one-half of women in the industrialized world receive antibiotics during pregnancy. Couple that with the increasingly large percentage of children born by Caesarean section — who by skipping their trip through the birth canal miss their first exposure to friendly bacteria — and the result, he says, is that “each generation… could be beginning life with a smaller endowment of ancient microbes than the last.”

Finally, he points to evidence that antibiotic use permanently changes the composition of the gut microbiome, altering the balance of bacterial species and maintaining resistant bacteria in the gut. The function and influence of the microbiome — in the gut, on the skin and everywhere in the body — is a huge research issue right now, with the founding by the National Institutes of Health of the Human Microbiome Project, not to mention continuing debates over the accuracy of the “hygiene hypothesis” and speculation that altering gut flora could influence everything from obesity to depression. This proposal dovetails with those inquiries — and also (you knew I had to get there eventually) with ongoing concern about antibiotic over-use encouraging the emergence of resistant organisms.

It’s understood that antibiotics are already over-prescribed in adults and children; reining in over-prescribing is one of the most difficult tasks in controlling the spread of superbugs. This new hypothesis, Blaser says, ought to put more force behind the push to reduce antibiotic overuse, especially in early life:

We urgently need to investigate this possibility. And, even before we understand the full scope, there is action we should take.
A new study showing that feeding mice a beneficial type of bacteria can ameliorate autism-like symptoms is "groundbreaking," according to University of Colorado Boulder Professor Rob Knight, who co-authored a commentary piece about the research appearing in the current issue of the journal *Cell*.

The autism study, published today in the same issue of *Cell*, strengthens the recent scientific understanding that the microbes that live in your gut may affect what goes on in your brain. It is also the first to show that a specific probiotic may be capable of reversing autism-like behaviors in mice.

"The broader potential of this research is obviously an analogous probiotic that could treat subsets of individuals with autism spectrum disorder," wrote the commentary authors, who also included CU-Boulder Research Associate Dorota Porazinska and doctoral student Sophie Weiss.

The study underscores the importance of the work being undertaken by the newly formed Autism Microbiome Consortium, which includes Knight as well as commentary co-authors Jack Gilbert of the University of Chicago and Rosa Krajmalnik-Brown of Arizona State University. The interdisciplinary consortium—which taps experts in a range of disciplines from psychology to epidemiology—is investigating the autism-gut microbiome link.

For the new *Cell* study, led by Elaine Hsiao of the California Institute of Technology, the researchers used a technique called maternal immune activation in pregnant mice to induce autism-like behavior and neurology in their offspring. The researchers found that the gut microbial community of the offspring differed markedly compared with a control group of mice. When the mice with autism-like symptoms were fed *Bacteriodes fragilis*, a microbe known to bolster the immune system, the aberrant behaviors were reduced.

Scientific evidence is mounting that the trillions of microbes that call the human body home can influence our gut-linked health, affecting our risk of obesity, diabetes and colon cancer, for example. But more recently, researchers are discovering that gut microbes also may affect neurology—possibly impacting a person's cognition, emotions and mental health, said Knight, also a Howard Hughes Medical Institute Early Career Scientist and an investigator at CU-Boulder's BioFrontiers Institute.
The Autism Microbiome Consortium hopes to broaden this understanding by further studying the microbial community of autistic people, who tend to suffer from more gastrointestinal problems than the general public.

People with autism spectrum disorder who would like to have their gut microbes sequenced can do so now through the American Gut Project, a crowdfunded research effort led by Knight.

The consortium also includes Catherine Lozupone and Kimberly Johnson of CU-Boulder, James Adams of Arizona State University, Mady Hornig of Columbia University, Sarkis Mazmanian of the California Institute of Technology, John Alverdy of the University of Chicago and Janet Jansson of Lawrence Berkeley Lab.

Provided by University of Colorado at Boulder

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References


SUGAR FED BAD BACTERIA IN THE GUT CAN TAKE OVER YOUR BRAIN LIKE AN ALIEN PRESENCE
Stabilize Gut Flora to treat all Mental Disease and Avoid Sugar

The world is awakening to WELLNESS. This was not even a word until recently. Now it is a world wide movement, people want to become WELL. Desiré has developed and credentialed a new Doctorate in Wellness to awaken people and teach the art of making themselves and others WELL. For more details go to the International University at www.imune.net